

PATENT SPECIFICATION

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(54) ELECTRICAL MACHINES

(71) We, SIEMENS AKTIEN-GESELLSCHAFT, a German Company of Berlin and Munich, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to electrical machines.

One electrical machine to which the invention relates is, for example, a commutator motor having a plastics brush-carrying plate supported at the motor housing through the intermediary of resilient damping means, the plate having a radial edge which has a profile such that it can be securely fixed by engagement of that edge in associated counter-profiling of the housing, the plate being provided with carbon-brush holders.

In one commutator motor (German Utility Model No. 1 931 941), a bearing end-plate has, for centring a brush-carrying plate, two diametrically oppositely disposed projections ("noses"), engaging as a fit into respective rectangular marginal recesses formed in the brush-carrying plate. Each projection is, furthermore, provided with a step or shoulder serving as a plane abutment for the brush-carrying plate. Due to peening-over operations effected at the shoulder edges formed between the steps and the non-shouldered elements of the projections, the brush-carrying plate is non-releasably secured to the bearing end-plate. The bearing end-plate is reinforced by four ribs having nipples projecting in an axial direction of the motor and supporting the brush carrying plate. The height of the nipples requires to be precisely dimensioned, in order that their end faces may project slightly above, in the axial direction, the bearing faces formed at the shoulders for the brush-carrying plate. In order to achieve good oscillation damping, the nipples of the reinforcing ribs also carry rubber plugs at which the brush-carrying plate bears, firmly secured thereagainst.

According to the present invention there is provided an electrical machine incorporating an electrically conductive rotary portion mounted on the shaft of the machine, and a brush-carrying member formed with a brush-carrying portion on which is mounted an electrically conductive brush element in slidable electrical contact with the said rotary portion, the brush-carrying member also being formed with a plurality of protuberances extending radially outwardly relative to the shaft axis and spaced apart therearound, the said protuberances being held between a first and a second part of a housing which surrounds the rotary portion in such a manner that the boundary between the first and second parts of the housing extends transversely in relation to the shaft axis, and the protuberances engaging in respective recesses formed in one of said housing parts, so that the housing parts provide stops against axial and radial movement of said brush-carrying member relative to said housing and in relation to said axis.

An embodiment of the present invention can be made in respect of which the outlay required for manufacture and assembly is diminished in relation to that required for a commutator motor made hitherto without necessarily putting operational reliability and service life at any great risk. In such an embodiment of the present invention, it is not necessary to provide separate securing of brush boxes to a brush-carrying plate. Furthermore, due to simple jamming-fast of the brush-carrying plate, with the aid of radially projecting protuberances thereof in associated recesses formed as housing "pockets", the brush-carrying plate is, simultaneously with assembly of the motor housing, adapted to be axially and radially fixed. Due to "pocket"-shaped rubber profile members pushed radially from the exterior, in a simple manner, onto the protuberances there are simultaneously achieved especially good noise damping and also sealing of the assembled housing in the zone of the recesses.

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One embodiment of the present invention may be, for example, a windscreen wiper drive having a transmission housing part securely screwed at an end face to a commutator motor stator and rotor housing part, recesses for receiving brush-carrying plate protuberances being formed at the periphery of the transmission housing part at the said end face thereof which end face bears against one end face of the stator and rotor housing part of the commutator motor. If the recesses extend radially outwardly beyond the periphery of the transmission housing part (not including the portions thereof which define, and are immediately adjacent to, those recesses), on the one hand a large amount of useful space may remain for carbon brushes suitable for long operation and, on the other hand, satisfactory noise damping can be obtained.

Reference will now be made, by way of example, to the accompanying diagrammatic drawing, in which:

Figure 1 shows an axial sectional view of an electrical machine embodying the present invention, and

Figure 2 shows a cross-sectional view of the machine shown in Figure 1, the broken line "I—I" indicating the section of Figure 1.

With reference to Figure 1, a windscreen wiper drive coupled to at least one wiper (not shown), has a housing comprising a motor housing part 1 of a commutator motor, which part is sealed at its left-hand end by a bearing end-plate 18 and the right-hand end of which bears against a transmission housing part 3, fast with the motor housing part 1, in the form of an integrated housing. Thus an independent bearing end-plate at the right-hand side of the motor housing part 1 is not required. A motor shaft 5 of a rotor 4 of the commutator motor is mounted at one end in a bearing 10 in the bearing end-plate 18 and at the other end in a bearing 11 retained in the left-hand part of the transmission housing part 3. Secured on the end, projecting at the right beyond the bearing 11 in the transmission housing part 3, of the motor shaft 5 is a worm 19 engaging into an associated worm wheel 12 of a worm drive coupled to drive a wiper arm. Secured to the inner side of the motor housing 1 are two dished magnets 13 and 14. Disposed at that end of the rotor 4 which is adjacent to the transmission housing part 3 is a commutator 6 against the surface of which bear carbon brushes 7, 8, 9 guided in box-form brush holder portions 24, 25, 26 of a brush carrier plate 2 and pressed under spring pressure against the commutator 6. It will be appreciated that each box-form brush holder portion provides two parts between which is held one of the carbon brushes. The brush carrier plate 2 with the brush holder portions 24, 25, 26, is a plastics element

injection-moulded in one piece. Simultaneously, radially projecting protuberances 21, 22, 23 are injection-moulded onto the outer periphery of the brush carrier plate 2.

Pushed onto the protuberances 21, 22, 23, radially from the exterior, are "pocket"-shaped rubber members 15, 16, 17; the "pocket"-shaped rubber member 17 is, for the sake of clarity, shown strongly hatched in Figure 2. The protuberances 21, 22, 23 having the pushed-on rubber members 15, 16, 17 are disposed in correspondingly adapted recesses taking the form of housing "pockets" 31, 32, 33, cast at the same time, at the outer periphery at the end face, facing the motor housing part 1, of the transmission housing part 3. As will be perceived in particular from Figure 2, the housing "pockets" 31, 32, 33 are designed to project radially outwardly beyond the periphery proper of the motor housing part 1 or of the transmission housing part 3. Thereby, inter alia the radial useful space for carbon brushes of maximum length and having a long service life is increased and, on the other hand, due to mounting radially externally to the maximum degree of the protuberances (21, 22, 23) of the brush carrier plate 2 in the rubber members 15, 16, 17 good noise damping is achieved. As will be perceived from Figure 2, the dimensions of the rubber members 15, 16, 17 and of the housing "pockets" 31, 32, 33 are so adapted to each other in advantageous manner that, on assembling the transmission housing part 3 and the motor housing part 1, simultaneous sealing of these two housing parts relative to each other is guaranteed due to the lateral walls of the rubber members 15, 16, 17.

Simultaneously with manufacture of the brush carrier plate 2, there are injection-moulded on at the periphery of the said brush carrier plate 2, between the brush holders 24, 25, 26, also radially outwardly half-open plastics securing sleeves 27, 28, 29 into which for example anti-interference choke coils can be jammed and retained in simple manner. For axial securing of the coils, plate-like stops 271, 281, 291 are simultaneously secured by moulding to the plastics securing sleeves. The stops extend across the sleeves, perpendicularly to the shaft axis.

In the assembly of the commutator motor, the brush carrier plate 2, manufactured in simple manner as one-piece injection-moulded element together with the brush holders and the securing sleeves, is, after pushing of the rubber members 15, 16, 17 on to the protuberances 21, 22, 23, inserted radially from the exterior into the associated housing "pockets" 31, 32, 33 of the transmission housing part 3. Thereby, the brush

carrier plate is fixed in the peripheral direction, in the radial direction and in the axial direction towards the transmission housing part 3. Due to simple fitting-on of the abutting motor housing part 1 and connection thereof with the transmission housing part 3, housing parts 1 and 3 being screwed against one another, axial fixing in the direction towards the motor housing part 1 is also obtained without any additional outlay.

Thus there can be provided a commutator motor having a plastics brush carrier plate bearing at a motor housing via resilient damping means, secured by means of a radial edge of the plate, which edge has a profile engaging an associated counter-profiling on the housing, and being provided with carbon-brush holders the brush carrier plate 2 being a plastics element injection-moulded in one piece with the brush holders 24, 25, 26 and also at least with protuberances 21, 22, 23 radially projecting at its periphery, the protuberances 21, 22, 23 being inserted into associated recesses formed in a stator housing part 1 or in a transmission housing part 3 of the commutator motor, in the sense of fixing which is radial and axial with respect to a shaft of the motor, being fixed in both axial directions due to the transmission housing part 3 and the stator housing part 1 disposed thereagainst.

WHAT WE CLAIM IS:—

1. An electrical machine incorporating an electrically conductive rotary portion mounted on the shaft of the machine, and a brush-carrying member formed with a brush-carrying portion on which is mounted an electrically conductive brush element in slidable electrical contact with the said rotary portion, the brush-carrying member also being formed with a plurality of protuberances extending radially outwardly relative to the shaft axis and spaced apart therearound, the said protuberances being held between a first and a second part of a housing which surrounds the rotary portion in such a manner that the boundary between the first and second parts of the housing extends transversely in relation to the shaft axis, and the protuberances engaging in respective recesses formed in one of said housing parts so that the housing parts provide stops against axial and radial movement of said brush-carrying member relative to said housing and in relation to said axis.

2. An electrical machine as claimed in claim 1, wherein the said brush-carrying member is made of plastics.

3. An electrical machine as claimed in claim 2, wherein the said brush-carrying member is a one-piece injection-moulded plate-like structure.

4. An electrical machine as claimed in any preceding claim wherein the said brush-carrying portion is formed as a holder having two parts between which is held the electrically conductive brush element.

5. An electrical machine as claimed in any preceding claim, wherein the electrically conductive brush element is made of carbon.

6. An electrical machine as claimed in any preceding claim, wherein an individual resilient member is held between each said protuberance and its associated recess, each resilient member being formed with a recess into which fits the associated protuberance, and each resilient member fitting into the associated recess formed in the said one of said housing parts.

7. An electrical machine as claimed in claim 6, wherein each said individual resilient member is made of rubber.

8. An electrical machine as claimed in any preceding claim, wherein a stator of the machine is mounted on the said first part of the housing.

9. An electrical machine as claimed in any preceding claim, the machine being a commutator motor.

10. An electrical machine as claimed in claim 9, further incorporating a transmission assembly adapted to drive at least one windscreen wiper and mounted within the said second part of the housing, the said shaft being coupled to drive the said transmission assembly.

11. An electrical machine as claimed in claim 10, the said transmission assembly being drivingly coupled to at least one windscreen wiper.

12. An electrical machine as claimed in claim 10 or 11, wherein the said second part of the housing is the said one of the said housing parts.

13. An electrical machine as claimed in any preceding claim, wherein the said first and second parts of the housing are fixed together by being screwed against one another.

14. An electrical machine as claimed in any preceding claim, wherein the said recesses formed in the said one of said housing parts extend, radially outwardly of the said shaft, beyond the periphery of the portions of the said one of said housing parts other than the portions thereof which define, and are immediately adjacent to, those recesses.

15. An electrical machine as claimed in any preceding claim, the said brush-carrying member being formed with a sleeve for holding an anti-interference choke coil.

16. An electrical machine as claimed in claim 15, wherein the sleeve is provided with a plate-like portion extending across the sleeve, perpendicularly to the said shaft axis,

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to act as a stop against movement of such an anti-interference choke coil along the sleeve.

- 5 17. An electrical machine as claimed in claim 15 or 16, further incorporating an anti-interference choke coil held in the said sleeve.

- 10 18. An electrical machine substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawing.

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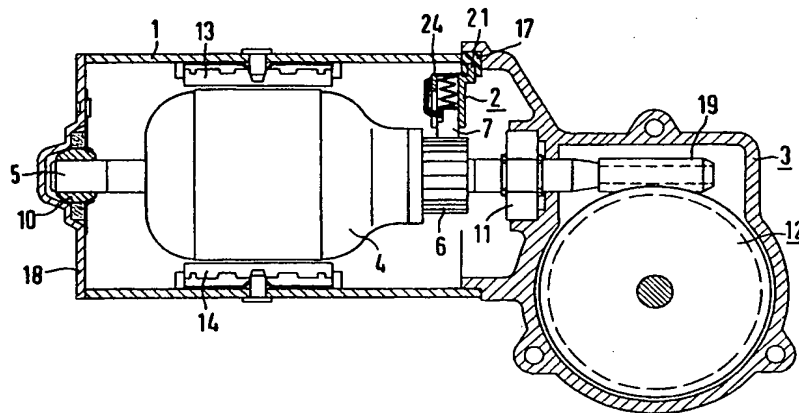


Fig. 1

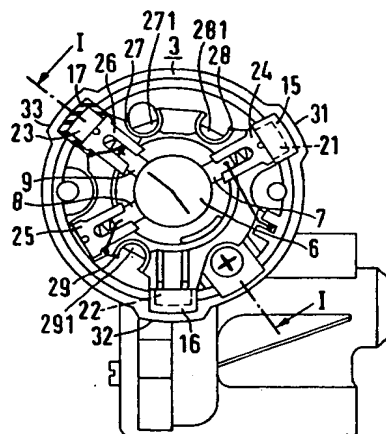


Fig. 2

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